

WHAT IS CLAIMED IS:

1. An optical receiver comprising:
a vertical lasing semiconductor optical amplifier (VLSOA) comprising:
a semiconductor active region;
an amplifying path traversing the semiconductor active region; and
a laser cavity including the semiconductor active region, wherein the laser cavity
is oriented vertically with respect to the amplifying path and pumping the
laser cavity above a lasing threshold clamps a gain along the amplifying
path to a substantially constant value; and
a photodetector coupled to the VLSOA.
2. The optical receiver of claim 1 wherein the photodetector is selected from a group
consisting of a PIN diode and an avalanche photodiode.
3. The optical receiver of claim 1 further comprising:
an optical fiber coupling the VLSOA to the photodetector, wherein the VLSOA and the
photodetector are discrete components.
4. The optical receiver of claim 1 wherein the VLSOA and the photodetector are integrated
onto a common substrate.
5. The optical receiver of claim 4 wherein the VLSOA is directly coupled to the
photodetector.
6. The optical receiver of claim 4 wherein:
the photodetector comprises an active region; and
the semiconductor active region of the VLSOA transitions into the active region of the
photodetector.

7. The optical receiver of claim 6 wherein:
the VLSEA further comprises a bottom cladding layer and a top cladding layer;
the photodetector further comprises a bottom cladding layer and a top cladding layer;
the bottom cladding layer of the VLSEA transitions into the bottom cladding layer of the
photodetector; and
the top cladding layer of the VLSEA transitions into the top cladding layer of the
photodetector.
8. The optical receiver of claim 4 further comprising:
an optical waveguide coupling the VLSEA to the photodetector, wherein the optical
waveguide is also integrated onto the common substrate.
9. The optical receiver of claim 8 wherein:
the optical waveguide comprises a core;
the photodetector comprises an active region; and
the semiconductor active region of the VLSEA transitions into the core of the optical
waveguide, which transitions into the active region of the photodetector.
10. The optical receiver of claim 4 wherein:
the photodetector comprises an active region; and
the semiconductor active region of the VLSEA and the active region of the photodetector
are based on a common structure which has been altered so that the
semiconductor active region of the VLSEA has a different transition energy than
the active region of the photodetector.
11. The optical receiver of claim 4 wherein:
the photodetector comprises an active region; and
the semiconductor active region of the VLSEA and the active region of the photodetector
have a same structure but are electrically biased differently so that the

semiconductor active region of the VLSEA has a different transition energy than the active region of the photodetector.

12. The optical receiver of claim 4 wherein the common substrate is an InP substrate.
13. The optical receiver of claim 4 wherein the optical receiver operates at a wavelength between 1.3 micron and 1.7 micron.
14. The optical receiver of claim 4 wherein the optical receiver is capable of detecting data at a data rate of at least 10 Gbps.
15. The optical receiver of claim 1 further comprising:
at least one additional photodetector; and
an optical splitter coupling the VLSEA to the photodetectors.
16. The optical receiver of claim 15 further comprising:
a semiconductor optical amplifier coupling the optical splitter to one of the photodetectors.
17. The optical receiver of claim 15 further comprising:
a plurality of optical amplifiers coupling the optical splitter to the photodetectors for equalizing optical signals received by the photodetectors.
18. The optical receiver of claim 15 wherein the VLSEA, the optical splitter and the photodetectors are integrated onto a common substrate.
19. The optical receiver of claim 15 wherein the optical splitter comprises a wavelength division demultiplexer.
20. The optical receiver of claim 15 wherein the optical splitter comprises an arrayed waveguide grating.

21. The optical receiver of claim 1 further comprising:
a feedback loop between the photodetector and the VLSEA for adjusting the substantially constant value.
22. The optical receiver of claim 1 wherein the photodetector is coupled to receive a ballast laser signal from the laser cavity of the VLSEA.
23. The optical receiver of claim 22 wherein the photodetector is vertically integrated with the VLSEA.
24. The optical receiver of claim 23 further comprising:
an optical filter vertically integrated between the VLSEA and the photodetector.
25. An optical receiver comprising:
a gain-clamped semiconductor optical amplifier comprising:
a semiconductor active region;
an amplifying path traversing the semiconductor active region; and
a laser cavity including the semiconductor active region, wherein pumping the laser cavity above a lasing threshold clamps a gain along the amplifying path to a substantially constant value; and
a photodetector coupled to receive a ballast laser signal from the laser cavity of the gain-clamped semiconductor optical amplifier.
26. The optical receiver of claim 25 wherein the laser cavity is oriented transversely with respect to the amplifying path.
27. The optical receiver of claim 25 wherein the laser cavity is oriented longitudinally with respect to the amplifying path.

28. The optical receiver of claim 25 further comprising:
an optical filter located between the gain-clamped semiconductor optical amplifier and
the photodetector.
29. The optical receiver of claim 25 further comprising:
a feedback loop between the photodetector and the gain-clamped semiconductor optical
amplifier for adjusting the substantially constant value.